

WHAT IS CLAIMED IS:

1           1.     A control method for a military vehicle having a plurality of  
2 input devices and a plurality of output devices, comprising:

3           (A)    determining desired output states of a first subset of said  
4 plurality of output devices based on I/O status information stored in an I/O  
5 status table, said determining step being performed by an interface  
6 module that comprises said I/O status table, said interface module being  
7 coupled to a first subset of said plurality of input devices and said first  
8 subset of said plurality of output devices, said interface module being  
9 further coupled to a plurality of additional interface modules by way of a  
10 communication network, said plurality of additional interface modules  
11 being coupled to a second subset of said plurality of input devices and a  
12 second subset of said plurality of output devices, said I/O status  
13 information stored in said I/O status table including input status  
14 information pertaining to input states of said first subset of said plurality  
15 of input devices and input status information pertaining to input states of  
16 said second subset of said plurality of input devices;

17           (B)    controlling said first subset of said plurality of output devices  
18 in accordance with said desired output states, said controlling step being  
19 performed by said interface module; and

20           (C)    maintaining said I/O status table, said maintaining step being  
21 performed by said interface module, said maintaining step including

22                   (1)    acquiring said input status information pertaining to  
23 said input states of said first subset of said plurality of input  
24 devices,

25                   (2)    storing said input status information pertaining to said  
26 input states of said first subset of said plurality of input devices in  
27 said I/O status table,

28                   (3)    acquiring, from said plurality of additional interface  
29 modules by way of said communication network, said input status

information pertaining to said input states of said second subset of said plurality of input devices, and

(4) storing said input status information pertaining to said input states of said second subset of said plurality of input devices.

2. A method according to claim 1, wherein each of said plurality of additional interface modules broadcasts I/O status information, and wherein said acquiring step (3) comprises receiving said broadcasts.

3. A method according to claim 2, wherein said broadcasts occur asynchronously.

4. A method according to claim 2, wherein each of said plurality of additional interface modules maintains respective additional I/O status tables, and wherein each of said plurality of additional interface modules receives said broadcasts and stores I/O status information received in said broadcasts to maintain said respective additional I/O status tables.

5. A method according to claim 4, wherein said I/O status table and said respective additional I/O status tables store substantially the same I/O status information.

6. A military vehicle comprising:  
a power distribution and control system, the power distribution and control system further including

(A) a power source;

(B) a power transmission link;

(C) a plurality of input devices;

(D) a plurality of output devices;

(E) a communication network;

(F) a plurality of microprocessor-based interface modules, said plurality of interface modules being coupled to said power source by way

of said power transmission link, said plurality of interface modules being interconnected to each other by way of said communication network, and said plurality of interface modules being coupled to said plurality of input devices and to said plurality of output devices by way of respective dedicated communication links, and said plurality of interface modules including

(1) a first microprocessor-based interface module, said first interface module being coupled to a first subset of said plurality of input devices and to a first subset of said plurality of output devices, said first interface module having a first data memory that stores input status information for substantially all of said plurality of input devices, and said first interface module including a first control program that is executable by said first interface module to control said first subset of said plurality of output devices based on input status information from said plurality of input devices stored in said first data memory,

(2) a second microprocessor-based interface module, said second interface module being coupled to a second subset of said plurality of input devices and to a second subset of said plurality of output devices, said second interface module having a second data memory that stores input status information for substantially all of said plurality of input devices, said second interface module including a second control program that is executable by said second interface module to control said second subset of said plurality of output devices based on input status information from said plurality of input devices stored in said second data memory, and

(3) a plurality of additional microprocessor-based interface modules, said plurality of additional interface modules each being coupled to a respective additional subset of said plurality of input devices and to a respective additional subset of said plurality of

42 output devices, said plurality of additional interface modules each  
43 including an additional control program that is executable to control  
44 said respective additional subset of said plurality of output devices  
45 based on input status information from said plurality of input  
46 devices;

47 wherein said plurality of interface modules, said plurality of input  
48 devices, and said plurality of output devices are distributed throughout  
49 said military vehicle; and

50 wherein each respective interface module is locally disposed with  
51 respect to the respective input and output devices to which said  
52 respective interface module is coupled so as to permit distributed data  
53 collection from said plurality of input devices and distributed power  
54 distribution to said plurality of output devices.

1 7. A military vehicle according to claim 6, wherein each of said  
2 plurality of interface modules is physically and functionally  
3 interchangeable with each remaining one of said plurality of interface  
4 modules.

1 8. A military vehicle according to claim 6, wherein said military  
2 vehicle is a multipurpose modular vehicle and comprises a chassis and a  
3 variant module, said variant module being mounted on said chassis, said  
4 chassis and said variant module cooperating to provide said military  
5 vehicle with a first type of functionality, and said variant module being  
6 removable and replaceable with other variant modules to form other  
7 military vehicles with other different types of functionality.

1 9. A military vehicle according to claim 8, wherein said plurality  
2 of interface modules are physically and functionally interchangeable with  
3 interface modules utilized by the other variant modules.

10. A military vehicle according to claim 6, wherein said first control program, said second control program and said additional control programs are substantially identical.

11. A military vehicle according to claim 6, wherein said plurality of output devices include first and second output devices, and

wherein, for said first and second output devices, said control program includes control logic to control said first and second output devices when at least some of said plurality of input devices have an input state that is undetermined.

12. A military vehicle according to claim 11, wherein for at least one I/O state of said vehicle in which an input state of one of said plurality of input devices is undetermined, said input state of said one input device is assumed by said control system to be a first state for purposes of said first output device and is assumed by said control system to be a second different state for purposes of said second output device.

13. A control method for a military vehicle comprising:

(A) providing a vehicle power distribution and control system,

(1) wherein said vehicle power distribution and control system comprises (a) a first plurality of input devices, a second plurality of input devices, and a plurality of additional input devices, (b) a first plurality of output devices, a second plurality of output devices, and a plurality of additional output devices, and (c) a first interface module, a second interface module, and a plurality of additional interface modules,

(2) wherein said first interface module, said second interface module, and said plurality of additional interface modules are connected by way of a communication network,

13 (3) wherein said first interface module, said second  
14 interface module, and said plurality of additional interface modules  
15 are distributed throughout said vehicle and are locally placed with  
16 respect to respective ones of said plurality of input and output  
17 devices,

18 (4) wherein said first interface module collects data from  
19 said first plurality of input devices and distributes power to said  
20 first plurality of output devices,

21 (5) wherein said second interface module collects data  
22 from said second plurality of input devices and distributes power to  
23 said second plurality of output devices, and

24 (6) wherein said first I/O interface module comprises a  
25 first I/O status table and said second I/O interface module  
26 comprises a second I/O status table;

27 (B) repetitively performing the following steps at said first  
28 interface module during operation of said first interface module, including

29 (1) acquiring input status information from said first  
30 plurality of input devices, said input status information pertaining to  
31 input states of said first plurality of input devices,

32 (2) storing said input status information from said first  
33 plurality of input devices in said first I/O status table,

34 (3) determining desired output states for said first plurality  
35 of output devices,

36 (4) storing output status information pertaining to said  
37 desired output states for said first plurality of output devices in said  
38 first I/O status table,

39 (5) controlling said first plurality of output devices in  
40 accordance with said desired respective output states,

41 (6) broadcasting, over said communication network, said  
42 input status information pertaining to said input states of said first

43 plurality of input devices to said second interface module and said  
44 plurality of additional interface modules,

45 (7) broadcasting, over said communication network, said  
46 output status information pertaining to said desired output states of  
47 said first plurality of output devices to said second interface module  
48 and said plurality of additional interface modules,

49 (8) acquiring, by way of said communication network,  
50 input status information pertaining to input states of said second  
51 plurality of input devices and output status information pertaining  
52 to output states of said second plurality of output devices,

53 (9) storing, in said first I/O status table, said input status  
54 information pertaining to said input states of said second plurality  
55 of input devices and said output status information pertaining to  
56 said output states of said second plurality of output devices,

57 (10) acquiring, by way of said communication network,  
58 input status information pertaining to input states of said additional  
59 plurality of input devices and output status information pertaining  
60 to output states of said additional plurality of output devices, and

61 (11) storing, in said first I/O status table, said input status  
62 information pertaining to said input states of said additional plurality  
63 of input devices and said output status information pertaining to  
64 said output states of said additional plurality of output devices; and

65 (C) repetitively performing the following steps at said second  
66 interface module during operation of said second interface module,  
67 including

68 (1) acquiring said input status information from said  
69 second plurality of input devices, said input status information  
70 pertaining to input states of said second plurality of input devices,

71 (2) storing said input status information from said second  
72 plurality of input devices in said second I/O status table,

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73 (3) determining desired output states for said second  
74 plurality of output devices,

75 (4) storing said output status information in said second  
76 I/O status table, said output status information pertaining to said  
77 desired output states for said second plurality of output devices,

78 (5) controlling said second plurality of output devices in  
79 accordance with said desired respective output states,

80 (6) broadcasting, over said communication network, said  
81 input status information pertaining to said input states of said  
82 second plurality of input devices to said second interface module  
83 and said plurality of additional interface modules,

84 (7) broadcasting, over said communication network, said  
85 output status information pertaining to said desired output states of  
86 said second plurality of output devices to said second interface  
87 module and said plurality of additional interface modules,

88 (8) acquiring, by way of said communication network,  
89 said input status information pertaining to said input states of said  
90 first plurality of input devices and output status information  
91 pertaining to output states of said first plurality of output devices,

92 (9) storing, in said second I/O status table, said input  
93 status information pertaining to said input states of said first  
94 plurality of input devices and said output status information  
95 pertaining to said output states of said first plurality of output  
96 devices,

97 (10) acquiring, by way of said communication network,  
98 input status information pertaining to input states of said additional  
99 plurality of input devices and output status information pertaining  
100 to output states of said additional plurality of output devices, and

101 (11) storing, in said second I/O status table, said input  
102 status information pertaining to said input states of said additional  
103 plurality of input devices and said output status information



1 17. A method according to claim 13, further comprising  
2 determining that said first interface module has been rendered inoperative  
3 based on a failure of said first interface module to perform at least one of

16 wherein said first interface module, said second interface module,  
17 and said plurality of additional interface modules include interface modules

18 that are located on said chassis and interface modules that are located on  
19 said variant module.

1 22. A method according to claim 13,  
2 wherein said controlling step (B)(5) comprises transmitting power  
3 control signals from said first interface module to respective ones of said  
4 first plurality of output devices, said power control signals being binary  
5 signals and each having an on state and an off state, and  
6 wherein, for each respective one of said power control signals,  
7 power is supplied to said respective one of said first plurality of output  
8 devices when said respective control signal is in said on state and is not  
9 supplied to said respective one of said plurality of output devices when  
10 said respective control signal is in said off state.

1 23. A multipurpose modular vehicle comprising:  
2 a chassis and a variant module, said variant module being mounted  
3 on said chassis, said chassis and said variant module cooperating to  
4 provide said vehicle with a first type of functionality, and said variant  
5 module being removable and replaceable with other variant modules to  
6 form other vehicles with other different types of functionality, and  
7 wherein said chassis and said variant module in combination include a  
8 power distribution and control system, said power distribution and control  
9 system further including

- 10 (A) a power source;  
11 (B) a power transmission link;  
12 (C) a plurality of input devices;  
13 (D) a plurality of output devices;  
14 (E) a communication network;  
15 (F) a plurality of microprocessor-based interface modules, said  
16 plurality of interface modules being coupled to said power source by way  
17 of said power transmission link, said plurality of interface modules being  
18 interconnected to each other by way of said communication network, and

said plurality of interface modules being coupled to said plurality of input devices and to said plurality of output devices by way of respective dedicated communication links, and said plurality of interface modules including

(1) a first microprocessor-based interface module, said first interface module being coupled to a first subset of said plurality of input devices and to a first subset of said plurality of output devices, said first interface module having a first data memory that stores input status information for substantially all of said plurality of input devices, and said first interface module including a first control program that is executable by said first interface module to control said first subset of said plurality of output devices based on input status information from said plurality of input devices stored in said first data memory,

(2) a second microprocessor-based interface module, said second interface module being coupled to a second subset of said plurality of input devices and to a second subset of said plurality of output devices, said second interface module having a second data memory that stores input status information for substantially all of said plurality of input devices, said second interface module including a second control program that is executable by said second interface module to control said second subset of said plurality of output devices based on input status information from said plurality of input devices stored in said second data memory, and

(3) a plurality of additional microprocessor-based interface modules, said plurality of additional interface modules each being coupled to a respective additional subset of said plurality of input devices and to a respective additional subset of said plurality of output devices, said plurality of additional interface modules each including an additional program that is executable to control said

50        respective additional subset of said plurality of output devices  
51        based on input status information from said plurality of input  
52        devices;

53        wherein said plurality of interface modules, said plurality of input  
54        devices, and said plurality of output devices are distributed throughout  
55        said military vehicle; and

56        wherein each respective interface module is locally disposed with  
57        respect to the respective input and output devices to which said  
58        respective interface module is coupled so as to permit distributed data  
59        collection from said plurality of input devices and distributed power  
60        distribution to said plurality of output devices.

1        24.    A vehicle system according to claim 23, wherein said chassis  
2        and said variant module respectively include first and second mating  
3        connectors, and wherein said first connector is also functionally and  
4        physically mateable with connectors used by the other variant modules.

1        25.    A vehicle system according to claim 23, wherein said  
2        interface modules are interchangeable with interface modules used by the  
3        other variant modules.

1        26.    A vehicle system according to claim 23, wherein said control  
2        system includes a plurality of switches that are located in a driver area of  
3        said vehicle, and wherein said plurality of switches has variable  
4        functionality depending on which variant module is mounted on said  
5        chassis.

1        27.    A military vehicle comprising:  
2        a power distribution and control system, the power distribution and  
3        control system further including

- 4        (A)    a power source;  
5        (B)    a power transmission link;  
6        (C)    a plurality of input devices;

7 (D) a plurality of output devices;

8 (E) a communication network;

9 (F) a plurality of microprocessor-based interface modules, said  
10 plurality of interface modules being coupled to said power source by way  
11 of said power transmission link, said plurality of interface modules being  
12 interconnected to each other by way of said communication network, and  
13 said plurality of interface modules being coupled to said plurality of input  
14 devices and to said plurality of output devices by way of respective  
15 dedicated communication links, and said plurality of interface modules  
16 including

- 17 (1) a first microprocessor-based interface module,  
18 (2) a second microprocessor-based interface module, and  
19 (3) a plurality of additional microprocessor-based interface  
20 modules; and

21 wherein said plurality of interface modules, said plurality of input  
22 devices, and said plurality of output devices are distributed throughout  
23 said military vehicle;

24 wherein each of said plurality of interface modules are coupled to a  
25 respective local subset of said plurality of input devices and to a  
26 respective local subset of said plurality of output devices so as to permit  
27 distributed data collection from said plurality of input devices and  
28 distributed power distribution to said plurality of output devices; and

29 wherein each of said plurality of interface modules collects input  
30 status information from said respective local subset of said plurality of  
31 input devices and broadcasts said input status information over said  
32 communication network to each of the remaining ones of said plurality of  
33 interface modules, each of said remaining ones of said plurality of  
34 interface modules receiving said input status information and locally  
35 storing said input status information.

28. A military vehicle according to claim 1, wherein said broadcasts of said input status information occur asynchronously.

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